ELFIN COVE BOARDWALK REPAIRS

RECONNAISANCE REPORT

ELFIN COVE, ALASKA

May 2007

Prepared for:
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1 PURPOSE AND NEED

The Denali Commission has appropriated a small amount of money to Elfin Cove for boardwalk repair and improvements. The purpose of this report is to identify existing hazardous areas, rank them by importance, and recommend selected improvements within available funding.

Complete inventory and analysis of the existing boardwalk for safety and code deficiencies is beyond the scope of this report.

Elfin Cove is a small community at the entrance of Icy Strait 70 miles west of Juneau, and is only accessible by floatplane or boat. The community is built along the edges of Elfin Cove, a small sheltered cove that provides a protected boat harbor. Wooden boardwalks provide the only access between residences, lodges, post office, community store, and the boat harbor. The local population increases from 15-30 during the winter to over 100 during the summer. Several hundred people visit Elfin Cove each week to pick up supplies, sport fish, or just visit a unique small Alaskan community. The State Department of Transportation and Public Facilities (DOT&PF) is the owner and operator of the boardwalk. DOT&PF's last boardwalk repair project was in 2000 and it consisted of replacing handrails and spot repairs to rotten decking and post foundations.

Elfin Cove is not part of a city or borough. They have a non-profit community corporation that is a subsidiary of the State of Alaska. The corporation organizes committees to operate and manage the community's water, electrical and fuel utilities. The Department asked the Community Corporation to identify and prioritize some boardwalk areas that need improvement.

The Community Corporation met, discussed, and agreed on the following prioritized list of areas of concern.

2 PROBLEMS/CONCERNS

2.1 Fire Hall Corner

The community fire hall consists of a 5-foot by 10-foot shed with a pump sitting in a wheelbarrow-type cart, several coils of hoses, and a couple of smaller hand-carried pumps. The community is currently applying for a grant to purchase some fire fighting equipment designed to be as easily portable as the existing equipment. Fire hall access is at a sharp narrow corner in the boardwalk. There is not enough area in front of the fire hall to provide clear easy access to remove and maneuver fire carts during an emergency situation.

2.2 Bridge at B-STA 0+070

The bridge at B-Station 0+070 crosses a small stream that cascades down the steep rocky hillside. Water runs and splashes up onto the boardwalk during high rainfall events. Also, along this section of boardwalk there is a handrail only on the downhill side of the boardwalk. The moving water in the stream, water running on the boardwalk, and lack of a handrail increases the risk of pedestrians slipping and falling at this area of the boardwalk.

2.3 Landslide Area Boardwalk

The trail and boardwalk along the 1996 landslide area is frequently covered with running water and rock/gravel washout. The landslide area is still active with loose rocks periodically rolling across or onto the boardwalk. One elderly resident just past the landslide area rides a rascal scooter (power mobility chair) from his house, up this steep boardwalk in order to get to the store and post office. This steep boardwalk and frequent rock debris and water are a hazard to this resident, on his scooter, and all pedestrians. Water running over the boardwalk also washes out the soil around the boardwalk base compromising its stability.

Photo 1 – Steep boardwalk at 1996 landslide area

2.4 Coho's to Generator Handrail

The boardwalk from Coho's Bar and Grill (Coho's), passing in front of the generator shed is steep and has a railing only on one side. Pedestrians have slipped on the boardwalk and fallen off into the swampy area behind the generator building. The steepness of the boardwalk, slick boardwalk surface, and lack of a railing all increase the risk to pedestrians.

Photo 2 – Boardwalk from Coho's

2.5 Boardwalk on Lot 4A

Several foundations under the boardwalk on Lot 4A have sunk 6 to 12 inches. Running water has eroded some foundations, while others have sunken into the soft soils. This has caused the boardwalk to tilt sideways and twist creating a hazardous walking surface. Movement of the boardwalk is putting stress on the utilities attached to the boardwalk, increasing the risk of utility outage.

Photo 3 – Boardwalk on Lot 4 A has twisted and tilted

2.6 Narrow Walk at B-STA 0+030

The boardwalk passes through a narrow spot between two houses near B-Station 0+030. Most of the boardwalk up to this area is about 60 inches wide. The boardwalk narrows down to 42 inches between the houses. Although meeting the minimum 36-inch width requirement for a wheelchair, it makes hauling freight through this area more difficult and would prohibit wheelchairs to pass each other at this location.

Photo 4 – Narrow walk at B-STA 0+030

2.7 Ramp to Beach

A set of stairs descends from the boardwalk down to the beach near A-Station 0+000. Residents are often carrying heavy loads while using this set of stairs, increasing the chance of a fall.

2.8 Re-Gravel Path

The boardwalk around downtown turns into a gravel pathway near A-Station 0+400. The DOT&PF boardwalk improvements in 2000 included graveling this pathway. Since this time the gravel has scattered and worn thin leaving areas uneven and muddy during heavy rains.

2.9 Deteriorating Substructure

Inspecting every structural member of the boardwalk is beyond the scope of this report. DOT&PF replaced many rotten sections of boardwalk in 2000 and in 2007 it still appears to be in fairly good shape structurally. However, a few areas of deterioration were observed during the site visit. Some spots include B-STA 0+000 where one set of posts and headers are deteriorating.

Photo 5 – B-STA 0+000 Post and headers are deteriorating

B-STA 0+560 Bridge foundation has been undermined.

B-STA 0+360 the boardwalk turns into a trail along this section. The trail is supported by several small wood log retaining structures. These logs are rotten and should be replaced.

At A-STA 0+310 a chunk of the boardwalk planking has broken out leaving a hole.

Photo 6 – A-STA 0+310

Future improvements should include a contingency item for inspecting all structural members and replacing miscellaneous rotten structural members as directed by the on-site engineer or inspector.

2.10 Cover Power Line

The power cable runs alongside or underneath the boardwalk. The cable is not covered at B-STA 0+360

Photo 7 – B-STA 0+360 Exposed power cable

2.11 Damaged Handrails

Elfin Cove received almost 300 inches of snow this winter. This heavy slow and ice falling off buildings has damaged many handrails. Locations of damaged handrails include:

B-STA 0+230 20 LF	B-STA 0+850 - 20 LF
A-STA 0+030 – 20 LF	A-STA 0+130 – 10 LF
A-STA 0+330 – 60 LF	A-STA 0+450 – 10 LF

Photo 8 – Damaged handrail at A-STA 0+330

2.12 Slippery Boardwalks

Slippery boardwalks were not officially listed on the Community Councils priority list, however they pose a greater safety risk than most of the other items. Council members mentioned several times while inspecting the boardwalk how slick the boardwalk gets and how frequently people slip and fall. Elfin Cove receives a lot of rain and algae starts to grow on the wood decking, particularly in areas that do not get direct sunlight. This algae growth, when not removed, can be more hazardous than ice. The Community Council has placed a strip of roofing paper down the center of the boardwalk in an effort to provide a slip resistant surface. However, this roofing paper only lasts one season or less before needing to be replaced. Replacing this roofing paper has been a volunteer effort and does not always get done.

2.13 Fuel Dock

The decking and handrails along the fuel dock boardwalk are deteriorating creating the risk of deck planks crushing under a load and handrails breaking off when used by pedestrians. The fuel dock height varies from a couple of feet off the ground to over 8 feet. Someone falling off the fuel dock ramp could be seriously injured. This boardwalk decking and handrails need to be replaced now. The boardwalk is founded on 12- to 18-inch diameter treated wood piles that appear to be in fair condition. There seems to be some uncertainty on if the state owns the fuel dock boardwalk.

Photo 9 – Fuel Dock

3 ALTERNATIVES

3.1 Fire Hall Corner

The boardwalk needs to be widened in front of the fire hall to provide adequate access during an emergency. The boardwalk should be extended from the existing boardwalk to the existing maintenance shed. This is an triangle shape area about 15-foot by 10-foot. The existing decking in this corner should be replaced so that planks span the entire width of the area and eliminate the tripping hazard of having a joint in the middle of a walking area.

3.2 Bridge at B-STA 0+070

The boardwalk needs to be raised about 12 inches when crossing the small stream at B-STA 0+070 to prevent water from running onto the boardwalk. The handrail on the downhill side will need to be raised the same 12 inches as the boardwalk. New handrail should also be added along the uphill side of the boardwalk.

3.3 Landslide Area Boardwalk

The boardwalk along this landslide area is at ground level and should be raised to allow drainage and rock debris to pass under the boardwalk. In order to create a more gradual slope, the boardwalk should be raised to a straight line grade from the top of the hill to near the house at B-STA 0+450.

Raising the boardwalk in this area would require a large portion of the project budget. Another option in this area would be to clean the fallen soil and rocks off and around the existing boardwalk and construct a small drainage ditch along the uphill side of the boardwalk. Then raise the boardwalk in one spot just enough to route the drainage ditch underneath the boardwalk. However, this option would not flatten the steep grade of the boardwalk and would require frequent maintenance of the ditch.

3.4 Coho's to Generator Handrail

Handrails need to be placed on both sides of the boardwalk from Coho's entrance down to the school house building. This will provide additional stability to pedestrians walking this section of the boardwalk and also keep them from falling off.

Flattening the grade along this section of boardwalk is not easily feasible because of the matching points, Coho's entrance at the top, generator shed in the middle, and school gym entrance at the bottom. Changing the grade at one end would adversely affect the building entrance at the other end.

One alternative to flatten the grade along this section would be to add stairways into the school house or Coho's. However, much of the community does not want stairs because some residents use rascal scooters and all freight is moved in carts and hand trucks along the boardwalks, which would become impracticable if stairs were added.

3.5 Boardwalk on Lot 4A

The boardwalk along this section should be jacked up and leveled. New foundations should be constructed that extend through the top soft soils. New posts and braces will then need to be constructed on the new foundations. Handrails along this section were not replaced in 2000, much of the handrail headers are weak or broken and should be replaced.

3.6 Narrow Walk at B-STA 0+030

Neither the Community Council nor the DOT&PF has identified widening the boardwalk at this location as a safety concern. Widening the sidewalk in this area would require a considerable work because the water line and power line would have to be relocated.

3.7 Ramp to Beach

The Community Council did not identify adding a ramp down to the beach as a main safety concern. However, a ramp at this location would make it easier for residents carrying heavy loads through this area.

3.8 Re-Gravel Path

The Community Council did not identify re-graveling the path as a main safety concern. However, a graveled path would provide a more level and stable walking surface. The pathway should be graveled from the end of the boardwalk at A-STA 0+400 to where it connects up to the fuel dock boardwalk.

3.9 Slippery Boardwalks

Several options are available to address slippery boardwalks. Options that are low cost do not last very long, while options that have a long life span are likely prohibitively expensive. The life expectancy of a non-slip surface will vary depending on many factors including; volume of traffic, condition of underlying decking, weather, maintenance frequency, and quality of installation.

Several options include:

3.9.1 Frequent Cleaning

The typical residential method for keeping algae from growing on wood decks and making them slippery is frequent cleaning and maintenance. Maintenance and cleaning of wood boardwalks is the same as wood decks on houses. There are many sources of information about the proper maintenance of wood decks including www.decks.com and www.awpa.com. Typical maintenance includes sweeping, application of a cleaning solution, pressure washing, and then if aesthetics is a consideration, the deck would be stained and/or sealed. Frequent cleaning results in the most natural and aesthetic surfacing. But, is also requires the largest maintenance effort.

3.9.2 Asphalt Roofing Rolls

Elfin Cove boardwalks currently use asphalt roofing rolls to provide a slip resistant surfacing. This surfacing has the lowest initial cost and is relatively easy to install and replace. However, this surfacing typically lasts about one season and only a half season in high traffic areas. Asphalt roofing rolls are currently installed in one strip down the center of the boardwalk. This leaves a strip of wood boardwalk on each side of the asphalt roofing roll creating an non-uniform and slippery walking surface.

Photo 10 – Asphalt roofing rolls

3.9.3 Asphalt Roofing Shingles

Individual asphalt shingles come in heavier duty weights than the asphalt roofing rolls. Individual shingles would be cut to the width of the deck planks and nailed. This would eliminate the cracking at each plank joint currently experienced by the asphalt roofing rolls. Asphalt roofing shingles are estimated to last about 2-3 times longer than asphalt roofing rolls.

3.9.4 Paint-On Non-Slip Coatings

There are several non-slip coatings on the market that are painted on. These coatings consist of a paint coating with sand to provide a rough non-slip surface. Paint materials can consist of standard oil or water based paints, two-part epoxy paint or a polyethylene coating. Manufacturer's literature indicates that some of these products are suitable for wood surfaces. However, specific examples of using this surfacing on wood in southeast have not been found to date. Two drawbacks with this surfacing is ensuring the proper installation and difficulty in replacement. Paint-On surfacing is like any other paint and needs a clean dry surface to be properly applied. This can be difficult while working out in the open in the rainforest climate of Southeast Alaska. Repair and replacement of Paint-On coatings consists of removing all loose paint and re-painting. Removing paint is labor-intensive and can be environmentally sensitive.

Manufacturers
http://www.astantislip.com
http://www.noskidding.com
http://www.nonslipcoating.com

Photo 11 – Samples of Paint-On non-slip coating finishes and colors

3.9.5 Synthetic Decking

There are a variety of products available in synthetic decking. It is not a 'plastic-y' looking material like it once was. Manufacturers now emboss a deep wood grain into the surface of the boards. Other manufacturers brush the surface for a raised grain effect. There are generally four separate categories for synthetic decks. Wood and polyethylene (soft plastic) composite, wood and polypropylene (hard plastic) composite, 100% plastic high density polyethylene (HDPE), and vinyl membrane products. Algae growth, that makes the boardwalks slick, is less severe on synthetic decking thank wooden decking. However, most synthetic decking manufacturers recommend regular cleaning maintenance.

Manufacturers
http://www.evergrain.com
http://www.correctdeck.com

Photo 12 – Sample of embossed wood grain finish for synthetic decking

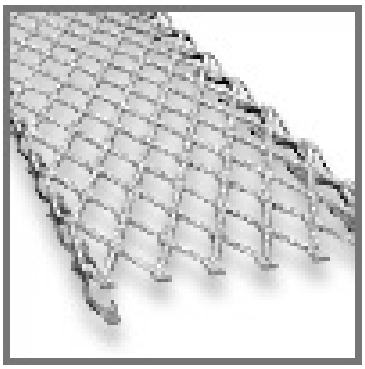
3.9.6 Expanded Metal Surfacing

Expanded metal surfacing is a thin metal grate that could be mechanically fastened to the existing wood decking. This grate structure would provide a non-slip surfacing. The grating is low maintenance and has a hot dipped galvanized coating and is estimated to last 10+ years. Drawbacks of this surfacing is that dirt and debris is difficult to remove and the surface is bumpier than other surfaces.

Manufacturers

http://www.handiramp.com
http://www.steelfabak.com

Photo 13 – Expanded metal surfacing



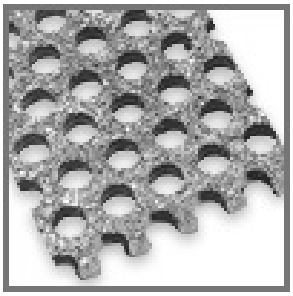
3.9.7 Steel or Fiberglass Grating

These materials are manufactured with a non-slip surfacing and would replace existing wood decking. Steel or fiberglass grating has a very high initial cost and very low annual maintenance cost. Fiberglass gratings come in several colors including, grey, green, orange, and yellow. These types of surfacing would significantly change the look of the boardwalk.

Manufacturers

http://www.slipnot.com
http://www.mcnichols.com/
http://www.amdgrating.com

Photo 14 – Samples of steel grating



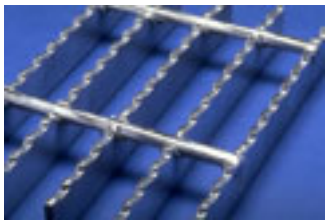
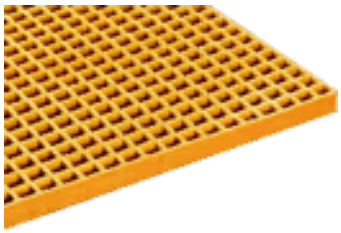
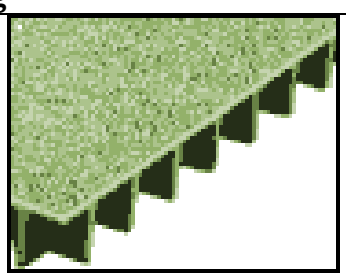


Photo 15 – Samples of fiberglass grating

3.10 Fuel Dock

The decking and handrails along the fuel dock boardwalk should be replaced from the connection with the A-Boardwalk out to where the handrail was reconstructed a couple years ago.

4 COST ESTIMATES

Cost estimates for each of the improvements are shown in the following table. Costs for design, construction administration, Inventory for Client and Agency Planning (ICAP), and a 20% contingency are included in the total costs shown.

	Total Cost
Fire Hall Corner	$30,000
Bridge at B-STA 0+070	$29,000
Landslide Area Boardwalk	$126,000
Coho's to Generator Handrail	$21,000
Boardwalk Lot 4A	$27,000
Narrow Walk at B-STA 0+030	$33,000
Ramp to Beach	$10,000
Re-Gravel Path A	$18,000
Fuel Dock Boardwalk	$34,000
Non-Skid Surfacing - Asphalt Roofing Rolls	$40,000

4.1 Non Slip Surfacing

Estimated construction costs for the different types of non-slip surfacing are as follows:

Asphalt Roofing Rolls	$2-$3 per S.F.
Asphalt Shingles	$4-$5 per S.F.
Paint-On Non-Slip Coating	$6-$10 per S.F.
Synthetic Decking	$12-$18 per S.F.
Expanded Metal Surfacing	$20-$30 per S.F.
Steel or Fiberglass Grating	$60-$180 per S.F.

5 RECOMMENDATIONS

The project budget is not large enough to cover all the improvements currently identified for the Elfin Cove Boardwalk Repairs. Considering safety and available funding, DOT&PF recommends the following improvements be constructed:

1. Fire Hall Corner
2. Non-Skid Surfacing - Asphalt Roofing Rolls
3. Bridge at B-STA 0+070
4. Coho's to Generator Handrail
5. Landslide Area Boardwalk – Clean Only
6. Boardwalk Lot 4A